Ch 5: Resource Description Framework

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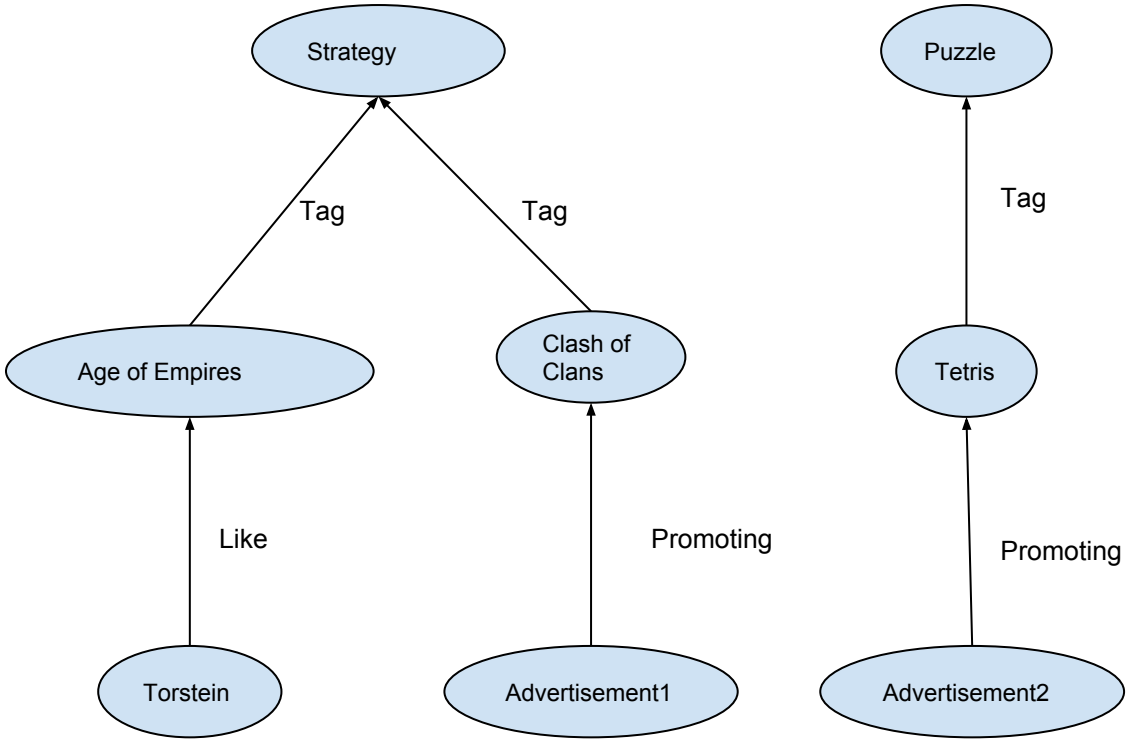
Example semantic network



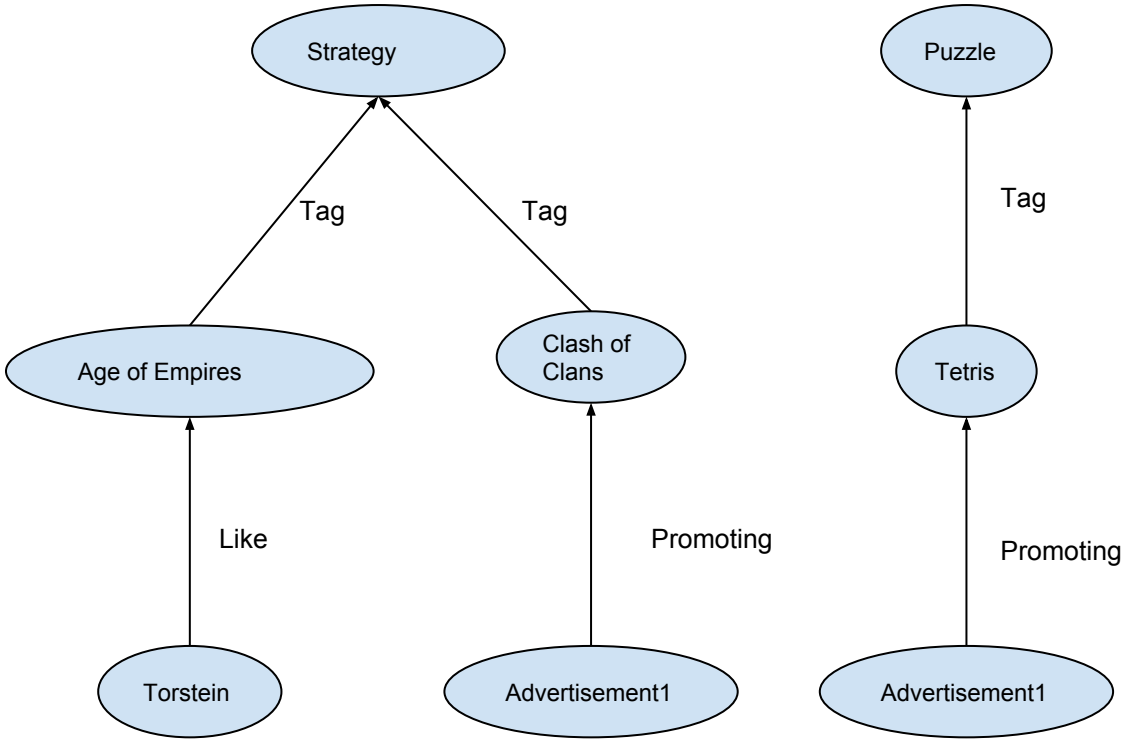
Setting:

- Facebook want to promote a game to Torstein
- Want to use all available information
- Want an automatic process

RDF

- Modeling data by making statements about resources
  - Like entity-relationship -> databases
  - Like class diagram -> object oriented programming
- Organized into triplets
  - Subject, predicate, object
  - Torstein, likes, Age of empires
- A collection of triplets form a RDF graph
- RDF can be serialized to:
  - XML
  - Turtle
    - (subject URI, predicate URI, object URI)
  - JSON-LD

Example triplets



Triplets:

- Torstein, like, Age of Empires
- advertisment1, promoting, Clash of Clans
- advertisment2, promoting, Tetris
- ageofempires.com, tag, strategy
- Clach of Clans, tag, strategy
- Tetris, tag, puzzle

HTML

- Markup language for web pages
- Difficult for machines to read
- Fixed tags - not extensible

```
<html>
    <head>
        <title>My Page</title>
    </head>
    <body>
        Hello World !
    </body>
</html>
```

XML

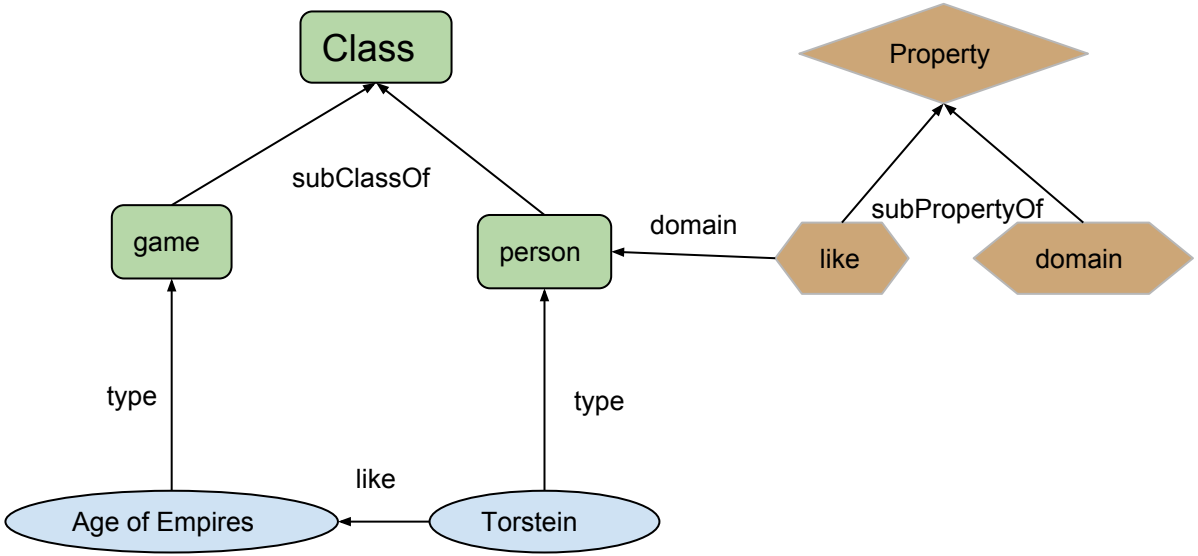
- Markup language readable by humans and machines
- Dynamic tags
- Often used in application programing interfaces

```
<?xml version=”1.0”?>
<!DOCTYPE message [
<!ELEMENT message (#PCDATA)>
]>
    <message>
        Hello World!
    </message>
```

RDF Schema

- Mechanism used to describe groups of related resources, RDF
- Uses RDF describe the data
- Defines basic classes and properties
  - Classes
    - rdfs:resource
    - rdfs:class
  - Properties
    - rdfs:domain
    - rdfs:range
    - rdfs:subClassOf
- Properties describe the relationship between subject resource and object resource

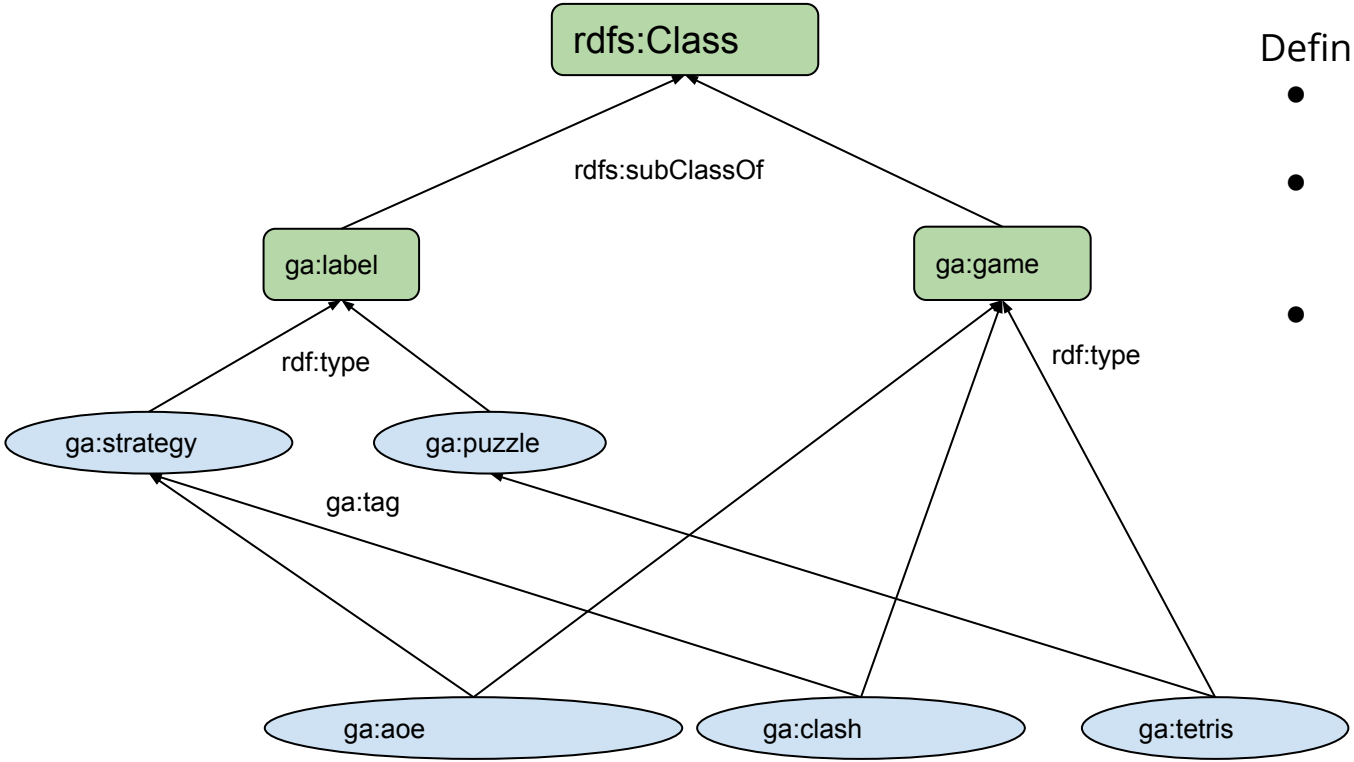
Example classes and properties



RDF Vocabulary

- A vocabulary define classes, properties and their meaning
- Enables meaningful communication between computers
- Each vocabulary has its own namespace
- Examples
  - foaf
  - dc
  - rdf
  - rdfs
  - owl

Example vocabulary



Defining our own vocabulary:

- ga -> http://games.com/ns/
- Classes:
  - game
  - labels
- Properties:
  - tag

XQuery

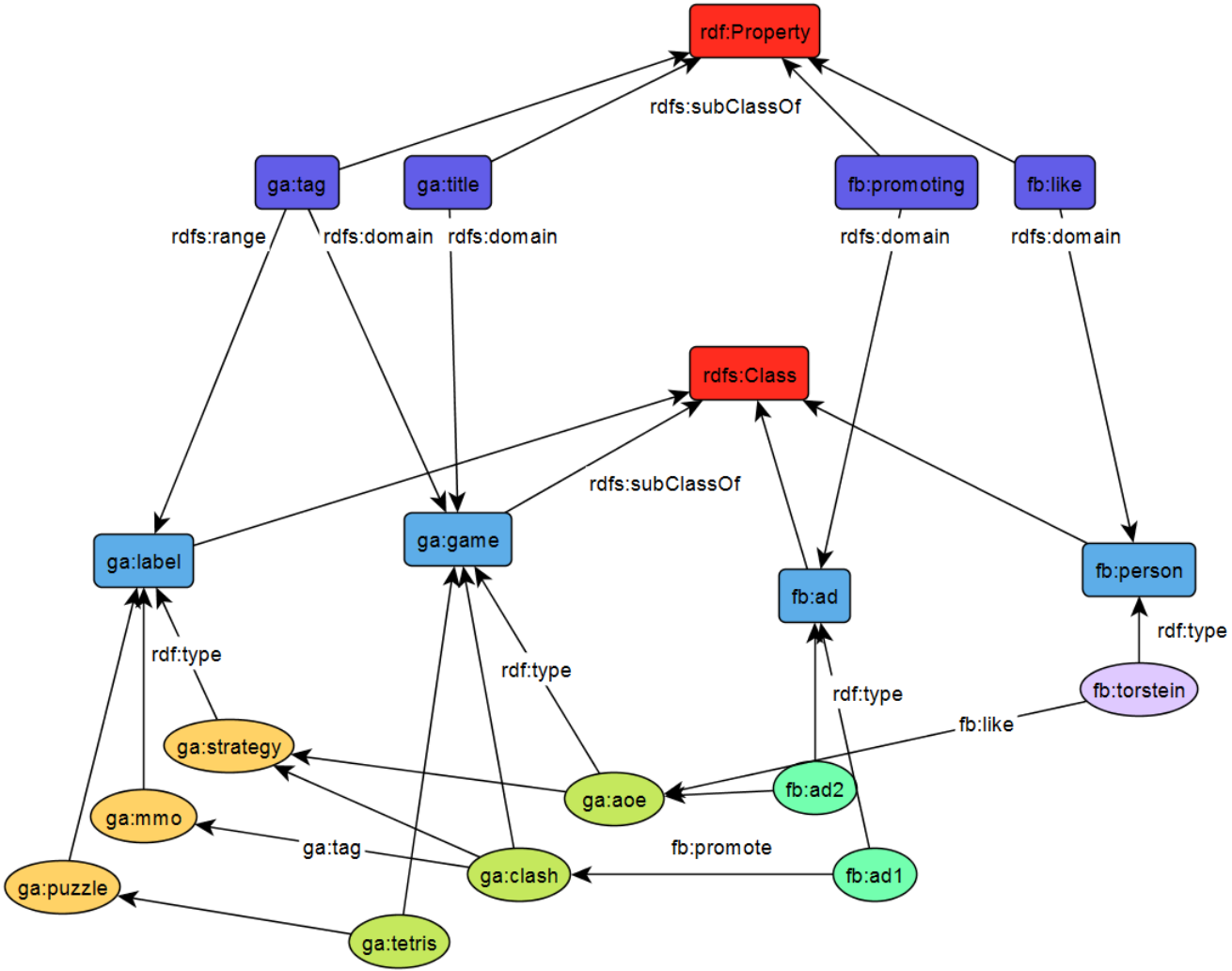
- Query Language for XML
- XQuery is a W3C query standard
- Inputs/outputs are objects defined by XML-Query data model
- Uses FLWR (“Flower”) Expressions
  - FOR ... LET... FOR... LET..
    WHERE...
    RETURN...

```
Finds all games published after 2002

FOR $x IN document("games.xml")/games

WHERE $x/year/text() > 2002

RETURN $x/title
```

SPARQL

- Query language designed to access information stored in RDF format
  - Developed by W3C
  - 2008

```
PREFIX ex: <http://example.com/ns#>

SELECT ?capital ?country
WHERE {
     ?x   ex:cityName ?capital ;
          ex:isCapitalOf ?y .
     ?y   ex:countryName ?country ;
          ex:isInContinent ex:Africa .
}
```


rdf:Property
rdfs:subClassOf
ga:tag
ga:title
fb:promoting
fb:like
rdfs:range
rdfs:domain
rdfs:domain
rdfs:domain
rdfs:domain
rdfs:Class
rdfs:subClassOf
ga:label
ga:game
fb:ad
fb:person
rdf:type
rdf:type
rdf:type
rdf:type
fb:torstein
fb:like
ga:strategy
ga:aoe
fb:ad2
ga:mmo
ga:tag
fb:promote
ga:clash
fb:ad1
ga:puzzle
ga:tetris

Summary

- Highlighted some characteristics of HTML and XML
- Introduced RDF
- The subject, predicate, and object is defined as the RDF triplet
- RDF Schema
- Live demo of SPARQL
- Conclude that RDF and RDFS can be used in the Semantic web, but lacks expressive power. They cannot for example define:
  - the properties of properties
  - necessary and sufficient conditions for class membership
  - equivalence and disjointness of classes
- Perhaps OWL in the next chapter will provide that